

IN THE CLAIMS

Please AMEND claims 28 and 46, as follows. For the Examiner's convenience, all the claims currently pending in this application have been reproduced below for the Examiner's convenience.

1 - 10. (Previously Cancelled)

11. (Previously Amended) A projection optical system comprising:

a plurality of lenses that cause birefringence; and

at least one optical element for substantially eliminating the birefringence caused by said plurality of lenses, wherein said at least one optical element is disposed between said plurality of lenses and an image plane of said projection optical system.

12. (Previously Amended) An optical system according to claim 11, wherein said at least one optical element has form birefringence.

13. (Previously Cancelled)

14. (Previously Amended) An optical system according to claim 12, wherein said at least one optical element produces the form birefringence by a grating having a period smaller than a wavelength used.

15. (Previously Amended) An optical system according to claim 14, wherein said grating is provided on the surface of at least one of said lenses.

16. (Previously Amended) An optical system according to claim 11, wherein said at least one optical element has a stress distribution.

17. (Previously Cancelled)

18. (Previously Amended) A projection exposure apparatus comprising:
an illumination system for illuminating a reticle with light; and
a projection optical system for projecting a pattern of the reticle onto a wafer, said projection optical system including a plurality of lenses that cause birefringence, and at least one optical element for substantially eliminating the birefringence caused by said plurality of lenses, wherein said at least one optical element is disposed between said plurality of lenses and an image plane of said projection optical system.

19. (Original) A projection exposure apparatus according to claim 18, wherein said illumination system illuminates the reticle with slit-like light, and further comprising a scanning device for simultaneously scanning the reticle and the wafer in a widthwise direction of the slit-like light, at a speed ratio corresponding to a projection magnification of said projection optical system.

20. (Previously Amended) A projection exposure apparatus according to claim 18, wherein said at least one optical element has form birefringence.

21. (Previously Cancelled)

22. (Previously Amended) A projection exposure apparatus according to claim 20, wherein said at least one optical element produces the form birefringence by a grating having a period smaller than a wavelength used.

23. (Previously Cancelled)

24. (Previously Amended) A projection exposure apparatus according to claim 18, wherein said at least one optical element has a stress distribution.

25. (Previously Amended) A projection exposure apparatus according to claim 24, wherein said at least one optical member is arranged so that a distribution, including a distribution of stresses produced by said at least one optical member, is effective to cancel the birefringence of said plurality of lenses.

26. (Previously Amended) A device manufacturing method comprising the steps of:
exposing a wafer to a device pattern by use of a projection exposure apparatus as
recited in claim 18; and
developing the exposed wafer.

27. (Previously Amended) A projection optical system comprising:
a plurality of lenses that cause birefringence; and
at least one optical element for substantially eliminating the birefringence caused
by said plurality of lenses, wherein said at least one optical element is disposed near a pupil of
said projection optical system.

28. (Currently Amended) A step-and-scan type projection exposure apparatus
comprising:
an illumination system for illuminating a reticle with light; and
a projection optical system for projecting a pattern of the reticle onto a wafer, said
projection optical system having a plurality of lenses that cause birefringence, and at least one
optical element for substantially eliminating the birefringence caused by said plurality of lenses,
wherein said at least one optical element is disposed near a pupil of said projection optical
system.

29. (Previously Amended) A device manufacturing method, comprising the steps of:
exposing a wafer to a device pattern by use of a projection exposure apparatus as
recited in claim 28; and
developing the exposed wafer.

30. (Previously Added) An optical system according to Claim 27, wherein said optical elements comprise a plurality of lenses each having birefringence and at least one element having form birefringence.

31. (Previously Added) An optical system according to Claim 27, wherein said optical elements comprise a plurality of lenses each having birefringence and at least one element having a stress distribution.

32. (Previously Added) A projection exposure apparatus according to Claim 28, wherein said optical elements comprise a plurality of lenses each having birefringence and at least one element having form birefringence.

33. (Previously Added) A projection exposure apparatus according to Claim 28, wherein said optical elements comprise a plurality of lenses each having birefringence and at least one element having a stress distribution.

34. (Previously Added) An optical system according to claim 12, wherein the amount of birefringence of said at least one optical element is substantially the same as the amount of birefringence of said plurality of lenses as a whole, and wherein the sign of birefringence of said at least one optical element is opposite to the sign of said plurality of lenses as a whole.

35. (Previously Added) An apparatus according to claim 20, wherein the amount of birefringence of said at least one optical element is substantially the same as the amount of birefringence of said plurality of lenses as a whole, and wherein the sign of birefringence of said at least one optical element is opposite to the sign of said plurality of lenses as a whole.

36. (Previously Added) An optical system according to claim 30, wherein the amount of birefringence of said at least one optical element is substantially the same as the amount of birefringence of said plurality of lenses as a whole, and wherein the sign of birefringence of said at least one optical element is opposite to the sign of said plurality of lenses as a whole.

37. (Previously Added) An apparatus according to claim 32, wherein the amount of birefringence of said at least one optical element is substantially the same as the amount of birefringence of said plurality of lenses as a whole, and wherein the sign of birefringence of said at least one optical element is opposite to the sign of said plurality of lenses as a whole.

38. (Previously Added) An optical system according to claim 30, wherein said at least one optical element produces the form birefringence by a grating having a period smaller than a wavelength used.

39. (Previously Added) A projection exposure apparatus according to claim 32, wherein said at least one optical element produces the form birefringence by a grating having a period smaller than a wavelength used.

40. (Previously Added) A device manufacturing method, comprising the steps of:
exposing a wafer with a device pattern by use of a projection exposure apparatus
as recited in claim 32; and
developing the exposed wafer.

41. (Previously Added) A device manufacturing method, comprising the steps of:
exposing a wafer with a device pattern by use of a projection exposure apparatus
as recited in claim 33; and
developing the exposed wafer.

42. (Previously Added) A device manufacturing method, comprising the steps of:
exposing a wafer with a device pattern by use of a projection exposure apparatus
as recited in claim 35; and
developing the exposed wafer.

43. (Previously Added) An optical system according to Claim 11, wherein said at least one optical element comprises a transparent plane plate.

44. (Previously Added) A projection exposure apparatus according to Claim 18, wherein said at least one optical element comprises a transparent plane plate.

45. (Previously Added) An optical system according to Claim 27, wherein said at least one optical element comprises a transparent plane plate.

46. (Currently Amended) A ~~step-and-scan~~ projection exposure apparatus according to Claim 28, wherein said at least one optical element comprises a transparent plane plate.

REMARKS

Applicant requests favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

Claims 11, 12, 14-16, 18-20, 22 and 24-46 are presented for consideration. Claims 11, 18, 27 and 28 are independent. Claims 28 and 46 have been amended to clarify features of the subject invention. Support for these changes can be found in the application as originally filed. Therefore, no new matter has been added.

For the reasons set forth in the Request for Reconsideration filed on August 28, 2003, Applicant submits that the instant application is in condition for allowance. Applicant requests, therefore, favorable reconsideration, withdrawal of the rejections set forth in the Office Action dated May 28, 2003, and an early Notice of Allowance.

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,



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